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L7: Entry 1 of 1 File: USPT Jun 8, 2004

DOCUMENT-IDENTIFIER: US 6748325 B1
TITLE: Navigation system

Abstract Text (1):
A carrier, such as an airplane, which outputs a warning sign if an artificial structure, such as a building, is in its path. The CPU of the carrier calculates the path by referring to the destination data representing the destination of the carrier.

Brief Summary Text (2):
The invention relates to navigation system and more particularly to that of airplanes, space shuttles, gliders, and all other types of carriers.

Brief Summary Text (3):
U.S. Pat. No. 5,566,073 introduces a pilot aid using synthetic reality consists of a way to determine the aircraft's position and attitude such as by the global positioning system (GPS), a digital data base containing three-dimensional polygon data for terrain and manmade structures, a computer, and a display. According to this prior art, the computer uses the aircraft's position and attitude to look up the terrain and manmade structure data in the data base and by using standard computer graphics methods creates a projected three-dimensional scene on a cockpit display. This presents the pilot with a synthesized view of the world regardless of the actual visibility. A second embodiment uses a head-mounted display with a head position sensor to provide the pilot with a synthesized view of the world that responds to where he or she is looking and which is not blocked by the cockpit or other aircraft structures. A third embodiment allows the pilot to preview the route ahead or to replay previous flights.

Brief Summary Text (4):
U.S. Pat. No. 5,574,648 introduces an improved airport control/management system for controlling and managing the surface and airborne movement of vehicular and aircraft within a defined and selected airport space envelope of an airport, the traffic, comprising apparatus for establishing a precise 3-dimensional digital map of the selected airport space envelope, the map containing GNSS positioning system reference points, a computer with a monitor screen for receiving and displaying the 3-dimensional map, transmit and receive radio equipment located on at least one vehicle/aircraft in the airport space envelope to generate and transmit continuous GNSS-based location reports a receiver associated with the computer to receive the reports from the vehicle/aircraft, programming associated with the computer and using the reports to superimpose 3-dimensional image corresponding to a path of the vehicle/aircraft onto the 3-dimensional map, apparatus associated with the 3-dimensional map for generating airport control and management signals as a function of the vehicle/aircraft path and computer aided design programming for manipulation of the 3-dimensional map and the image of the vehicle/aircraft and the path to a desired apparent line of observation, to control the traffic in the airport, the improvement comprising: the layering of the airport map creating a layered airport map having at least one layer, the layering permitting thereby sorting and tracking of each of the vehicle/aircraft, each of the layers selected from the group

determined by function consisting of air traffic control phase of flight, notams, forbidden zone identification, airline and airport operations. The invention may also include systems and apparatus for identifying the type of vehicle and the 3-dimensional orientation of same.

Brief Summary Text (5):
U.S. Pat. No. 5,867,804 introduces a method and system supporting seamless 3-dimensional operations in a multi-dimensional environment using orbiting satellite compatible coordinate references and databases. According to this prior art, the system includes a control and management element and an aircraft/surface vehicle element. The two elements utilize a common worldwide coordinate reference frame and a common time reference for its operation. Precise collision detection, navigation and 3-dimensional situational awareness functions are performed using precise vector processing algorithms in combination compatible databases. Seamless air and ground operations are supported in such a fashion that the overall processing mathematics are directly applicable anywhere around the globe, only the specific databases need change for any given site. No regional distance scaling corrections or discontinuity compensations are required from site to site anywhere around the globe. Such a system greatly simplifies the operation of airports and other 4-dimensional environments. The simplicity of this system provides high availability and reduced system exposure to single point failures, while providing superior performance for air traffic controllers and aircraft/surface vehicle operators in the 3-dimensional space envelope.

Brief Summary Text (7):
U.S. Pat. No. 5,904,724 introduces a method and apparatus that allows a remote aircraft to be controlled by a remotely located pilot who is presented with a synthesized three-dimensional projected view representing the environment around the remote aircraft. According to this prior art, a remote aircraft transmits its three-dimensional position and orientation to a remote pilot station. The remote pilot station applies this information to a digital database containing a three dimensional description of the environment around the remote aircraft to present the remote pilot with a three dimensional projected view of this environment. The remote pilot reacts to this view and interacts with the pilot controls, whose signals are transmitted back to the remote aircraft. In addition, the system compensates for the communications delay between the remote aircraft and the remote pilot station by controlling the sensitivity of the pilot controls.

Brief Summary Text (10):
U.S. Pat. No. 5,983,161 introduces GPS satellite (4) ranging signals (6) received (32) on comm1, and DGPS auxiliary range correction signals and pseudolite carrier phase ambiguity resolution signals (8) from a fixed known earth base station (10) received (34) on comm2, at one of a plurality of vehicles/aircraft/automobiles (2) are computer processed (36) to continuously determine the one's kinematic tracking position on a pathway (14) with centimeter accuracy. According to this prior art, GPS-based position is communicated with selected other status information to each other one of the plurality of vehicles (2), to the one station (10), and/or to one of a plurality of control centers (16), and the one vehicle receives therefrom each of the others' status information and kinematic tracking position. Objects (22) are detected from all directions (300) by multiple supplemental mechanisms, e.g., video (54), radar/lidar (56), laser and optical scanners. Data and information are computer processed and analyzed (50,52,200,452) in neural networks (132, FIGS. 6-8) in the one vehicle to identify, rank, and evaluate collision hazards/objects, an expert operating response to which is determined in a fuzzy logic associative memory (484) which generates control signals which actuate a plurality of control systems of the one vehicle in a coordinated manner to maneuver it laterally and longitudinally to avoid each collision hazard, or, for motor vehicles, when a collision is unavoidable, to minimize injury or damage therefrom. The operator is warned by a heads up display and other modes and may override. An automotive auto-pilot mode is provided.

Brief Summary Text (12):
U.S. Pat. No. 6,006,158 introduces an Airport Guidance System and Method which provides for GNSS compatible seamless airport guidance capability. According to this prior art, the computer system provides a automated lighting functions based upon GNSS based position and spatially compatible databases. The system and method utilize precise GNSS compatible zones, the Earth Centered Earth Fixed (ECEF) WGS-84 coordinate reference frame, GNSS compatible local coordinate frames such as local and state plane grids, zone-based automated airport lighting control, travel path information management processes which allow for the intelligent control of airport lighting systems. True airport independent processing is achieved when the ECEF coordinate reference frame is utilized. The lighting methods and processes are applicable to vehicles and aircraft operating in a controlled airport space envelope as well as other remote user sites with or without the assistance of air traffic controller. The system utilizes broadcast Automatic Dependent Surveillance (ADS) information from participating aircraft and vehicles. Although the processing methods may be employed using other surveillance information derived from radar sources with some degradation in performance due to radar inaccuracies and inability to produce accurate 3-dimensional velocity. The methods and processes employed provide a fundamental framework for increased airport safety, operational efficiency, energy savings and improved automation.

Brief Summary Text (14):
U.S. Pat. No. 6,021,374 introduces a stand alone terrain conflict detector of an aircraft which includes a global positioning system (GPS) receiver, an inertial navigation system, navigational and topographical databases, a control panel, a central processing unit (CPU), which CPU generates position data, a current flight path vector and control signals, an obstacle detector which receives the position data and the current flight path vector and which generates a flight path signal, an alert signal identifying a terrain threat to the aircraft and a projected flight path vector, a video generator coupled to the obstacle detector and the CPU, and a display connected to the video generator. According to this prior art, the display outputs one of a 2D image, a first 3D image and a second 3D image and the terrain threat generated by video generator. Advantageously, the video generator generates the 2D image responsive to the flight path signal and navigational data during the first mode of operation, generates the first 3D image including the projected flight path vector responsive to the flight path vector and one of navigational data and topographical data during the second mode of operation, and automatically generates, whenever the alert signal is generated, the second 3D image, including an escape vector, having a scale different than that of the first 3D image, responsive to the projected flight path vector and one of the navigational data and the topographical data during the third mode of operation. A method for operating the stand alone terrain conflict detector is also described.

Brief Summary Text (17):
U.S. Pat. No. 6,088,654 introduces a device for aiding aerial navigation, carried on board an aircraft, which receives on an input, status indications representing its spatial position and its velocity vector, and stores a 3D representation of the relief overflown. According to this prior art, it comprises processing define, as a function of the status indications, an exploration sector referred to the aircraft, and calculate in this sector a contour as a function of the intersection of this sector with the relief, with a view to the displaying thereof. The sector is defined by a sheet of trajectory lines obtained on the basis of the velocity vector and of auxiliary vectors calculated by shifting the velocity vector of the aircraft according to a chosen angular scanning law.

Brief Summary Text (20):
U.S. Pat. No. 6,134,500 introduces a system and method for generating a minimum-cost airline flight plan from a point of origin through a set of fix points to a destination point. According to this prior art, a set of navigation airways from

the point of origin to the destination point, including predefined fix points and vectors for high altitude flight, and a set of predetermined flight planning altitudes is stored in a database. Operational data for the flight and weather data for the flight is also stored in the database, as well as station data, station approach and departure procedures, predefined flight restricted areas, and flight performance data. The predefined fix points are transformed from the Cartesian plane onto a new coordinate system based on the great circle route between the origin and the destination. Each transformed fix point is assigned an ordinal value, and an acyclic network is constructed based on the ordinal values and within a feasible search region which excludes any flight restricted areas. Using dynamic programming techniques and shortest path optimization, a minimum cost flight path from the point of origin through a plurality of predefined navigation fix points to a destination point is calculated. The minimum cost flight path calculations take into account weather data for predetermined flight planning altitudes, aircraft weight and payload data, and performance data. The system comprises a general purpose computer having a memory, a database stored in the memory, and a means executing within the general purpose computer for determining the minimum cost flight path from a point of origin through a set of predefined navigation fix points to a destination point.

Brief Summary Text (22):
U.S. Pat. No. 6,182,005 introduces an Airport Guidance System and Method which provides for GNSS compatible airport guidance capability. According to this prior art, the computer system provides automated navigation functions based upon GNSS based position and spatially compatible databases. The system and method utilize precise GNSS compatible zones, the Earth Centered Earth Fixed (ECEF) WGS-84 coordinate reference frame, GNSS compatible local coordinate frames such as local and state plane grids, zone-based automated airport control, travel path information management processes which allow for the intelligent control of airport traffic. True airport independent processing is achieved when the ECEF coordinate reference frame is utilized. The navigation methods and processes are applicable to vehicles and aircraft operating in a controlled airport space envelope as well as other remote user sites with or without the assistance of air traffic controller. The system utilizes broadcast Automatic Dependent Surveillance (ADS) information from participating aircraft and vehicles. Although the processing methods may be employed using other surveillance information derived from radar sources with some degradation in performance due to radar inaccuracies and inability to produce accurate 3-dimensional velocity. GNSS compatible guidance is provided by a GNSS compatible navigation capability utilizing GPS compatible mathematical processing. Guidance information is computed in the ECEF coordinate frame and displayed to the vehicle operator using a X,Y graticuled display indicating the current position with respect the true course. Other display formats involving the display of digital maps, and positions provide situational awareness. Situational awareness displays are supported with ECEF compatible incursion processing using GPS Position, Velocity and Time of applicability (PVT) information. The methods and processes employed provide a fundamental framework for increased airport safety, operational efficiency, energy savings and improved automation.

Brief Summary Text (25):
U.S. Pat. No. 6,275,773 introduces GPS satellite (4) ranging signals (6) received (32) on comm 1, and DGPS auxiliary range correction signals and pseudolite carrier phase ambiguity resolution signals (8) from a fixed known earth base station (10) received (34) on comm2, at one of a plurality of vehicles/aircraft/automobiles (2) which are computer processed (36) to continuously determine the one's kinematic tracking position on a pathway (14) with centimeter accuracy. According to this prior art, that GPS-based position is communicated with selected other status information to each other one of the plurality of vehicles (2), to the one station (10), and/or to one of a plurality of control centers (16), and the one vehicle receives therefrom each of the others' status information and kinematic tracking position. Objects (22) are detected from all directions (300) by multiple

supplemental mechanisms, e.g., video (54), radar/lidar (56), laser and optical scanners. Data and information are computer processed and analyzed (50,52,200,452) in neural networks (132, FIGS. 6-8) in the one vehicle to identify, rank, and evaluate collision hazards/objects, an expert operating response to which is determined in a fuzzy logic associative memory (484) which generates control signals which actuate a plurality of control systems of the one vehicle in a coordinated manner to maneuver it laterally and longitudinally to avoid each collision hazard, or, for motor vehicles, when a collision is unavoidable, to minimize injury or damage therefrom. The operator is warned by a heads up display and other modes and may override. An automotive auto-pilot mode is provided.

Brief Summary Text (27):
U.S. Pat. No. 6,304,050 introduces a system that creates vision-based, three-dimensional control of a multiple-degree-of-freedom dexterous robot, without special calibration of the vision system, the robot, or any of the constituent parts of the system, and that allows high-level human supervision or direction of the robot. According to this prior art, the human operator uses a graphical user interface (GUI) to point and click on an image of the surface of the object with which the robot is to interact. Directed at this surface is the stationary selection camera, which provides the image for the GUI, and at least one other camera. A laser pointer is panned and tilted so as to create, in each participating camera space, targets associated with surface junctures that the user has selected in the selection camera. Camera-space manipulation is used to control the internal degrees of freedom of the robot such that selected points on the robot end member move relative to selected surface points in a way that is consistent with the desired robot operation. As per the requirement of camera-space manipulation, the end member must have features, or "cues", with known location relative to the controlled end-member points, that can be located in the images or camera spaces of participant cameras. The system is extended to simultaneously control tool orientation relative to the surface normal and/or relative to user-selected directions tangent to the surface. The system is extended in various ways to allow for additional versatility of application.

Brief Summary Text (28):
U.S. Pat. No. 6,311,108 introduces an aircraft guidance system which uses radar imaging to verify airport and runway location and provide navigation updates. According to this prior art, the system is applicable to flight operations in low visibility conditions.

Brief Summary Text (29):
U.S. Pat. No. 6,314,363 introduces an Airport Control and Management System and Methods for use by an air traffic controller, pilots and vehicle drivers which provides for a GNSS compatible computer processing environment which supports airport control and management functions in the air and on the ground. According to this prior art, the computer system provides for automation and a computer human interface supporting air traffic controller functions. The processing environment is based upon GNSS compatible position, velocity, time information and GNSS spatially compatible databases. The computer human interface combines the data entry role of issuing clearances with automated routing, conformance monitoring and lighting control functions. The system and methods utilize precise GNSS compatible zones, the Earth Centered Earth Fixed (ECEF) WGS-84 coordinate reference frame, GNSS compatible local coordinate frames such as local and state plane grids, travel path information management processes which allow for the intelligent control of airport lighting systems. True airport independent processing is achieved when the ECEF coordinate reference frame is utilized. The system utilizes broadcast Automatic Dependent Surveillance (ADS) information from participating aircraft and vehicles. Although the processing methods may be employed using other surveillance information derived from radar of multi-lateration sources with some degradation in performance due to radar inaccuracies and inability to produce accurate 3-dimensional GNSS compatible velocity. Radio receiving equipment receives the

broadcast ADS information which is then supplied to the computer system. The computer system utilizes GNSS compatible position and velocity data to control the operation of airport lights using zone incursion processing methods. The methods and processes employed provide a fundamental framework for increased airport safety, operational efficiency, energy savings and improved automation resulting in reduced controller workload.

Brief Summary Text (30):
U.S. Pat. No. 6,320,579 introduces a primary flight display (PFD) for an aircraft generating a 3-dimensional (3D) symbology indicative of the aircraft situational information. According to this prior art, the 3D symbology includes a 3D vertical path error symbol and a 3D lateral flight path error symbol. Several 3D altitude symbols are also displayed which collectively render a 3D representation of the aircraft situation. The 3D symbology enhances the pilot's awareness of the aircraft situation to accurately control the aircraft, and to easily to monitor the performance during manual and automatic flight.

Brief Summary Text (32):
U.S. Pat. No. 6,340,289 introduces Method and apparatus for controlling an aircraft engine with a single, manually-operable lever which includes structure and function for generating a pilot thrust command from the single lever. According to this prior art, a processor is coupled to the single lever and (i) receives the generated pilot thrust command, (ii) receives a plurality of detected ambient air flight conditions, (iii) receives a plurality of detected engine performance parameters, (iv) determines first and second engine control commands based on the received pilot thrust command, the detected ambient air flight conditions, and the engine performance parameters, and (v) outputs first and second output signals respectively corresponding to the first and second engine control commands. Preferably, the engine control commands comprise propeller RPM and engine inlet manifold air pressure commands, and the detected ambient air flight conditions comprise air speed and altitude.

Brief Summary Text (36):
U.S. Pat. No. 6,405,975 introduces a system for aiding ground maneuvering of an airplane. According to this prior art, the system includes at least one camera mounted on the airplane for generating video images of at last one gear with tires, preferably a main or nose landing gear and the surrounding ground. The cockpit of the airplane includes a video display device that displays the generated video images and a user interface that allows selection of the format for displaying the generated video images. A camera mounted within a moveable component of the airplane is mounted on a movable device that compensates for component movement. The system also includes a display generator for generating in real-time superimposed oversteer targets on the displayed video images. The video images with oversteer targets assist the pilot in determining the airplane's actual position relative to runways, taxiways, obstacles and other ground features and to maneuver a plane with a wide wheel track long wheelbase, or both accordingly.

Brief Summary Text (37):
U.S. Pat. No. 6,415,219 introduces the invention which relates to the field of management of land-based vehicles on the airport territory using satellite positioning technologies. According to this prior art, the technique of real-time tracking and management of land-based vehicles of the airport includes creation of a geoinformation system of the airport territory, real-time determination of coordinates of vehicles using satellite positioning devices, control of speed and/or routes of vehicle movement and management of vehicle traffic. Additionally, state of vehicles and/or time of execution of works by each vehicle are controlled and movement of and execution of works by vehicles in accordance with time technological schedules of postflight servicing of aircrafts on the basis of daily plans of flights is handled. The geoinformation system of the airport territory is formed in the two-dimensional coordinates, and coordinates of vehicles are

determined according to the relative geographic coordinates.

Brief Summary Text (40):
It is an object of the present invention to provide a system and method to prevent airplanes and/or other carriers from colliding into obstacles.

Brief Summary Text (41):
Still another object of the present invention to provide a system and method to prevent airplanes and/or other carriers from being sabotaged by terrorists.

Detailed Description Text (3):
As illustrated in FIG. 1a airplane 300 includes computer 200. Computer 200 is responsible of controlling the navigation of airplane 300.

Detailed Description Text (4):
FIG. 1b illustrates the block diagram of the computer installed in the cockpit portion of airplane 300. CPU 211 controls and administers the overall function and operation of computer 200. CPU 211 uses RAM 206 to temporarily store data and/or to perform calculation to perform its function. RAM 206 is also used to store a plurality of data and programs necessary to perform the present invention. Video generator 202 generates analog and/or digital video signals which are displayed on monitor 201. Sound generator 205 generates analog and/or digital audio signals that are transferred to speaker 204. ROM 207 stores data and programs which are necessary to perform the present invention. Antenna 212 sends and receives communication data, location data and various types of wireless signals. Signal processor 208 converts a stream of data produced by CPU 211 into a specific format (for example, data compression) in order to be sent by antenna 212 in a wireless fashion, and also converts a stream of wireless data received by antenna 212 into a specific format which is readable by CPU 211. Input signals are input by input device 210, such as keyboard, ON/OFF switches, joystick, and the signal is transferred to CPU 211 via input interface 209 and data bus 203. Direction controller 213 controls the direction of airplane 300 (FIG. 1a) in which computer 200 is installed under the control and administration of CPU 211. Altitude controller 214 controls the altitude of airplane 300 in which computer 200 is installed under the control and administration of CPU 211. Speed controller 215 controls the speed of airplane 300 in which computer 200 is installed under the control and administration of CPU 211. Angle controller 216 controls the angle of airplane 300 in which computer 200 is installed under the control and administration of CPU 211. GPS navigation system 217 calculates and identifies the present location of airplane 300 in the actual three-dimensional space by way of utilizing the method so-called "GPS" or "global positioning system."

Detailed Description Text (7):
FIG. 3 illustrates the method of utilizing the three-dimensional (3D) map stored in area 501 (FIG. 2). In the example illustrated in FIG. 3 several objects, such as buildings, exist in the three-dimensional space, i.e., object 401, object 402, object 403, object 404, and object 405. GPS navigation system 217 (FIG. 1a) identifies the actual location of airplane 300 and applies the location data to the three-dimensional map stored in area 501. In the present example the altitude of airplane 300 exceeds the heights of objects 401, 402,403, and 405, but does not exceed the height of object 404. Assuming that all of these objects are located on the path of airplane 300. If airplane 300 does not alter its course it will result in colliding with object 404.

Detailed Description Text (8):
FIG. 4 illustrates the method of airplane 300 to avoid colliding with any objects during actual flight before such flight is initiated. The destination data which represents the destination of airplane 300 is manually input by input device 210 (FIG. 1b) (S1). CPU 211 (FIG. 1b) calculates the course to the destination based on the destination data and compares with the three-dimensional data stored in area

501 of RAM 206 (FIG. 2) (S2). If any of the objects stored in area 501, which is in the path of airplane 300, is higher than its navigation altitude (S3) CPU 211 outputs a warning sign and/or sound from monitor 201 (FIG. 1b) and/or speaker 204 (FIG. 1b) and cancels the input data input from input device 210 (S4).

Detailed Description Text (9):
FIG. 5 illustrates another method of airplane 300 to avoid colliding with any objects during actual flight before such flight is initiated. The destination data which represents the destination of airplane 300 is manually input by input device 210 (FIG. 1b) (S1). CPU 211 (FIG. 1b) calculates the course to the destination based on the destination data and compares with the three-dimensional data stored in area 501 of RAM 206 (FIG. 2) (S2). If any of the objects stored in area 501, which is in the path of airplane 300, is higher than its navigation altitude (S3) CPU 211 calculates an alternative course to the destination and outputs a notice sign and/or sound which indicates that the course has been altered from monitor 201 (FIG. 1b) and/or speaker 204 (FIG. 1b) (S4).

Detailed Description Text (10):
FIG. 6 illustrates the method of airplane 300 to avoid colliding with any objects during an actual flight after such flight is initiated. CPU 211 (FIG. 1b) periodically checks the present location of airplane 300 during flight by utilizing the navigation data received from GPS navigation system 217 (FIG. 1b) via data bus 203 (FIG. 1b) (S1). Such navigation data is periodically compared with the three-dimensional data stored in area 501 of RAM 206 (FIG. 2) (S2). If any of the objects stored in area 501, which is in the path of airplane 300, is higher than its navigation altitude (S3) CPU 211 outputs a warning sign and/or sound from monitor 201 (FIG. 1b) and/or speaker 204 (FIG. 1b) (S4).

Detailed Description Text (11):
FIG. 7 illustrates another method of airplane 300 to avoid colliding with any objects during actual flight after such flight is initiated. CPU 211 (FIG. 1b) periodically checks the present location of airplane 300 during flight by utilizing the navigation data received from GPS navigation system 217 (FIG. 1b) vial data bus 203 (FIG. 1b) (S1). Such navigation data is periodically compared with the three-dimensional data stored in area 501 of RAM 206 (FIG. 2) (S2). If any of the objects stored in area 501, which is in the path of airplane 300, is higher than its navigation altitude (S3) CPU 211 calculates an alternative course to the destination and outputs a notice sign and/or sound which indicates that the course has been altered from monitor 201 (FIG. 1b) and/or speaker 204 (FIG. 1b) (S4). If the alternative course is attempted to be overwritten by signal input from input device 210 (FIG. 1b) (S5) CPU 211 cancels such input signal (S6).

Detailed Description Text (13):
FIG. 8a through FIG. 10 illustrates the remote controlling system of airplane 300.

Detailed Description Text (14):
As illustrated in FIG. 8aand FIG. 8b airplane 300 may be remotely controlled by host H. Host H includes a computer system same or similar to computer 200 (FIG. 1b) which enables to remotely control airplane 300 by signals input from input device same or similar to input device 210 (FIG. 1b). When remote controlling system is initiated host H which is located in a remote location sends a control signal to airplane 300 in a wireless fashion (S1a). Airplane 300 periodically receives various types of signals via antenna 212 (FIG. 1b). The received signal is processed (e.g., decompressed) by signal processor 208 (FIG. 1b) and is transferred to CPU 211 (FIG. 1b) via data bus 203 (FIG. 1b) (S1b). If CPU 211 determines that the received signal is a control signal produced by host H (S2) all of the signals input from input device 210 (FIG. 1b) thereafter are blocked and nullified (S3). CPU 211 sends response signal 601 (S4a), which is received by host H (S4b). Then host H sends a command signal (S5a), which is received by airplane 300 in the manner described in S1b above (S5b). CPU 211 operates airplane 300 in compliance

with command signal 605 received from host H (S7). The sequence of 54a through S7 is repeated until a cancellation signal which indicates to deactivate the remote controlling system is included in command signal 605 (S6). Once the remote controlling system is deactivated signal input from input device 210 (FIG. 1b) is valid thereafter and operation of airplane 300 from its cockpit is resumed (S8).

Detailed Description Text (15):
FIG. 9 illustrates the basic structure of response signal 601 described in S4a and S4b in FIG. 8a. Response signal 601 is composed of header 602, response data 603, and footer 604. Header 602 and footer 604 indicate the beginning and end of response signal 601. Response data 603 includes data regarding the present altitude, speed, direction, and angle of airplane 300.

Detailed Description Text (16):
FIG. 10 illustrates the basic structure of command signal 605 described in S5a and S5b in FIG. 8a. Command signal 605 is composed of header 606, command data 607, and footer 608. Header 606 and footer 608 indicate the beginning and end of command signal 605. Command data 607 includes data regarding the renewed altitude, speed, direction, and angle of airplane 300. As another embodiment command data 607 may include the data regarding destination instead. The remote controlling system is cancelled if command data 607 includes a cancellation signal instead of data regarding renewed altitude, speed, direction, and angle of airplane 300.

Detailed Description Text (18):
FIG. 11 through FIG. 12b illustrate the emergency landing system of airplane 300.

Detailed Description Text (19):
As illustrated in FIG. 11 RAM 206 includes area 502. Area 502 stores a plurality of location data representing the locations of a plurality of airports. Here the term airport includes any facility which is capable of landing airplanes, space shuttles, gliders, and any other carriers. In the present example location data V represents the location of airport #1, location data W represents the location of airport #2, location data X represents the location of airport #3, and location data Y represents the location of airport #4. The plurality of location data are linked with three-dimensional map stored in area 501 of RAM 206 (FIG. 2), therefore, these location data can be identified on the three-dimensional map stored in area 501.

Detailed Description Text (20):
FIG. 12a and FIG. 12b illustrate the emergency landing system by utilizing the location data stored in area 502 of RAM 206 (FIG. 11). Host H which is located in a remote location sends a control signal to airplane 300 in a wireless fashion (S1a). Airplane 300 periodically receives various types of signals via antenna 212 (FIG. 1b). The received signal is processed (e.g., decompressed) by signal processor 208 (FIG. 1b) and transferred to CPU 211 (FIG. 1b) via data bus 203 (FIG. 1b) (S1b). If CPU 211 determines that the received signal is a control signal produced by host H (S2) all of the signals input from input device 210 (FIG. 1b) thereafter are blocked and nullified (S3). CPU 211 identifies the present location by utilizing GPS navigation system 217 (FIG. 1b) and compares with the location data stored in area 502 of RAM 206 (FIG. 11). CPU 211 selects the nearest airport and inputs the location data of the selected airport as the new destination (S5). Airplane 300 sends a response signal (S6a), which is received by host H (S6b), and airplane 300 initiates an automatic landing process to the location of the selected airport (S7). As another embodiment of the present invention the location data can be selected manually by utilizing input device 210 and render input device 210 remain activated only for that purposes, and select the nearest airport only when no airport was selected within a specified time. Or as another embodiment airplane 300 may select a predetermined location and initiate the automatic landing process thereto.

Detailed Description Text (21):
As another embodiment of the present invention the emergency landing system can be performed without involving host H. This embodiment is not shown in any drawings. CPU 211 (FIG. 1b) periodically checks the signal from input device 210 (FIG. 1b). If an emergency signal is input from input device 210 which indicates that airplane 300 must be landed at the nearest airport all of the signals input from input device 210 (FIG. 1b) thereafter are blocked and nullified. CPU 211 identifies the present location by utilizing GPS navigation system 217 (FIG. 1b) and compares with the location data stored in area 502 of RAM 206 (FIG. 11). CPU 211 selects the nearest airport and inputs the location data of the selected airport as the new destination and initiates an automatic landing process to the location of the selected airport. As another embodiment of the present invention the location data can be selected manually by utilizing input device 210 and render input device 210 remain activated only for that purposes, and select the nearest airport only when no airport was selected within a specified time. Or as another embodiment airplane 300 may select a predetermined location and initiate the automatic landing process thereto.

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Set Name side by side	**Query**	**Hit Count**	**Set Name** result set
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR			
L7	l5 and L6	10	L7
L6	obstacle	111334	L6
L5	l3 and L4	39	L5
L4	display$	2056281	L4
L3	l1 same L2	45	L3
L2	ground adj traffic	342	L2
L1	air adj traffic	4704	L1

END OF SEARCH HISTORY

Refine Search

Search Results -

Terms	Documents
L12 and L17	28

Database:

US Pre-Grant Publication Full-Text Database
US Patents Full-Text Database
US OCR Full-Text Database
EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Search: L18

Refine Search

Recall Text | Clear | Interrupt

Search History

DATE: Tuesday, March 22, 2005 Printable Copy Create Case

Set Name side by side	**Query**	**Hit Count**	**Set Name** result set
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR		
L18	l12 and L17	28	L18
L17	l4 and L15	87	L17
L16	l14 and L15	0	L16
L15	(air adj1 traffic) and (ground adj1 traffic)	93	L15
L14	l4 and L13	718	L14
L13	l2 and L12	8972	L13
L12	symbol	367248	L12
L11	l4 and L10	1	L11
L10	obstacle adj symbol	4	L10
L9	l7 and L8	1	L9
L8	symbol	367248	L8
L7	l5 and L6	1	L7
L6	(ground or air) near obstacle	1187	L6

L5	l2 and L4	2190	L5
L4	aircraft or airplane	306089	L4
L3	l1 and L2	1	L3
L2	graphical near2 interface	47224	L2
L1	4283705.pn. or 4368517.pn. or 5359890.pn. or 5420582.pn. or 5450329.pn. or 5797106.pn. or 5884217.pn. or 5945927.pn. or 6057786.pn. or 6112141.pn. or 6154151.pn. or 6202026.pn. or 6243645.pn. or 6271768.pn.	28	L1

END OF SEARCH HISTORY

Refine Search

Search Results -

Terms	Documents
L7 and L8	1

Database:
US Pre-Grant Publication Full-Text Database
US Patents Full-Text Database
US OCR Full-Text Database
EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Search: L9

Refine Search

Recall Text Clear Interrupt

Search History

DATE: Tuesday, March 22, 2005 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR		
L9	17 and L8	1	L9
L8	symbol	367248	L8
L7	15 and L6	1	L7
L6	(ground or air) near obstacle	1187	L6
L5	12 and L4	2190	L5
L4	aircraft or airplane	306089	L4
L3	11 and L2	1	L3
L2	graphical near2 interface	47224	L2
L1	4283705.pn. or 4368517.pn. or 5359890.pn. or 5420582.pn. or 5450329.pn. or 5797106.pn. or 5884217.pn. or 5945927.pn. or 6057786.pn. or 6112141.pn. or 6154151.pn. or 6202026.pn. or 6243645.pn. or 6271768.pn.	28	L1

END OF SEARCH HISTORY